Benchmarking and Tracking for Case Studies

Energy Management Workshop

August 4, 2016

Overview

- Energy Basics
  - Energy vs. Power
  - What is a kWh?
- Benchmarking Efficiency at WWTPs
- Tracking Your Energy Use
  - Energy Assessment Tool (R4 EAT)
  - Finding information on your bill

Energy vs. Power

- Energy
  - Measures a quantity
  - Common units of energy: kWh, Joules, Calories, Therms, BTUs…
- Power
  - Measures a rate
  - Other units of power: HP, calories/min, …?

Quantities & Rates

Quantity	Unit	Rate	Unit
Distance	Miles	Speed	Miles per hour
Volume	Gallons	Flowrate	Gallons per minute
Money	Dollars	Salary	Dollars per year
Food Energy	Calories	Power	Calories per minute
Electrical Energy	kiloWatt-hour	Power	kW

What is a kWh?

k	= kilo	(Greek for 1,000)
W	= Watt	(unit of power)
h	= hour	(like a man-hour for labor)

kilo x Watt x hour = 1000 Watt-hours

1000	W bulb	x 1 hr	= 1000 Watt-hours
100	W bulb	x 10 hrs	= 1000 Watt-hours
1	W bulb	x 1000 hrs	= 1000 Watt-hours

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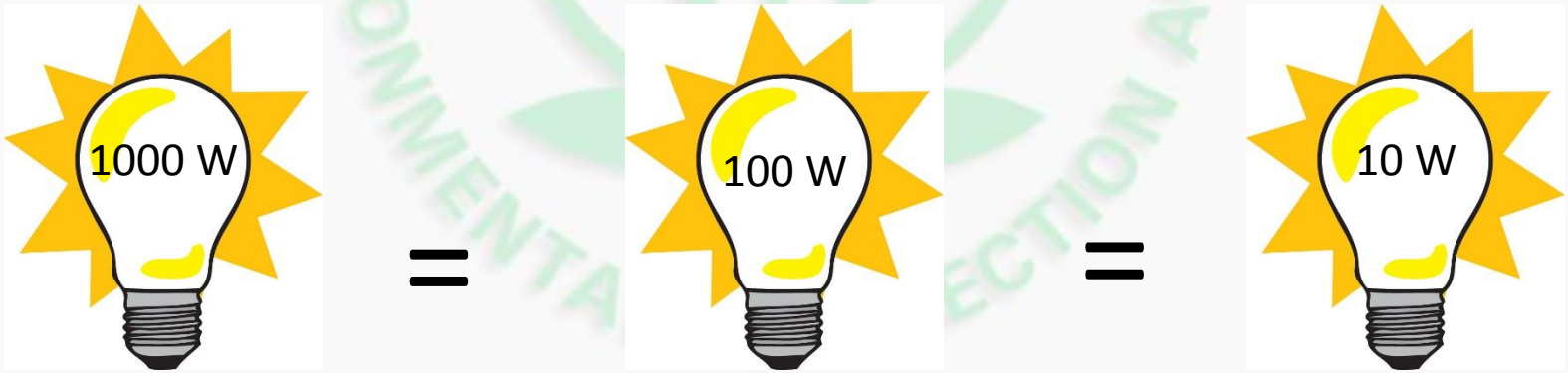


1 hour

10 hours

100 hours

Measuring Efficiency

- Cars → miles per gallon
- Manufacturing → Cost per unit
- Buildings → BTUs per square foot

- What makes sense for wastewater?
  - kWh per volume treated (kWh/MG) ←
  - kWh per pollutant removed (kWh/lb BOD)

“Normal” for WWTPs?

Literature says: 1800-2800 kWh/MG, but…

WWTP	kWh/MG	Avg Daily Flow (MG)	Approx Monthly Cost
Alexander City	9700	1.2	$28,000
Dauphin Island	4180	0.5	$5,000
Dothan – Cypress Creek	2400	1.4	$8,000
Dothan – Omussee	3570	3.1	$26,500
Enterprise	3510	1.9	$16,000
Fort Payne	2670	1.5	$9,600

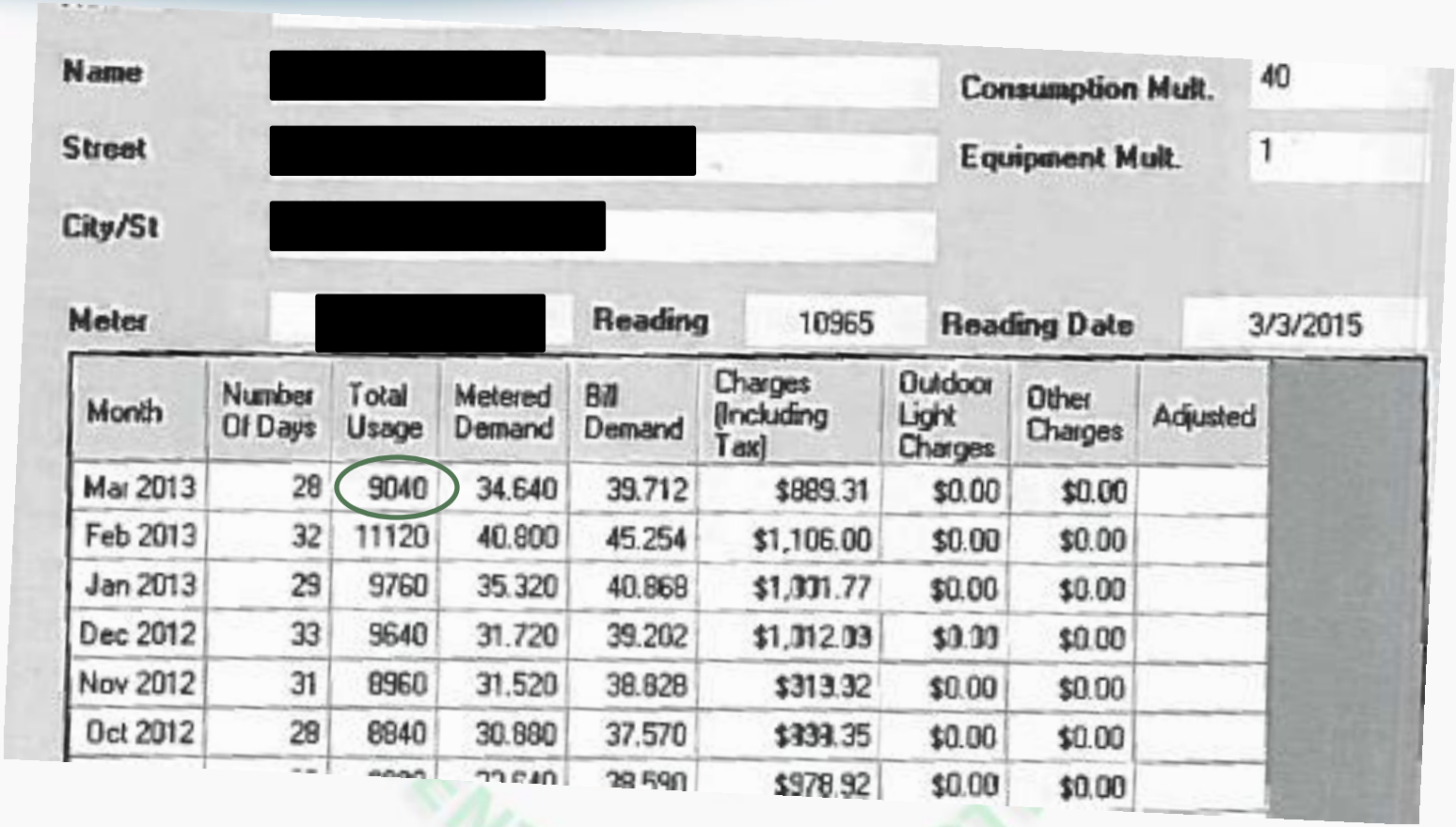
What can you expect to save?

WWTP	kWh/ MG	kWh/MG after suggested changes	% Savings	Estimated Annual Cost Savings
Alex. City	9700	7160	26%	$104,000
Dauphin Island	4180	3270	21%	$18,000
Dothan (CC)	2400	1265	47%	$19,000
Dothan (O)	3570	2500	33%	$24,000
Enterprise	3510	2600	25%	$22,000
Fort Payne	2670	1890	29%	$42,000

Tracking Energy Use

Region 4 Energy Assessment Tool (EAT)

Power Bills



Name [redacted]
Street [redacted]
City/St [redacted]
Meter [redacted]
Consumption Mult. 40
Equipment Mult. 1
Reading 10965
Reading Date 3/3/2015

Month	Number Of Days	Total Usage	Metered Demand	Bill Demand	Charges (Including Tax)	Outdoor Light Charges	Other Charges	Adjusted
Mar 2013	28	9040	34.640	39.712	$889.31	$0.00	$0.00	
Feb 2013	32	11120	40.800	45.254	$1,106.00	$0.00	$0.00	
Jan 2013	29	9760	35.320	40.868	$1,001.77	$0.00	$0.00	
Dec 2012	33	9640	31.720	39.202	$1,012.03	$0.00	$0.00	
Nov 2012	31	8960	31.520	38.828	$313.32	$0.00	$0.00	
Oct 2012	28	8840	30.880	37.570	$339.35	$0.00	$0.00	
					$978.92	$0.00	$0.00	

Features:

1. Usage in kWh
2. Metered Demand vs. Billed Demand
3. # of Days Billed

Drawbacks:

1. Demand and kWh charge lumped
2. Limited meter data

BREAKDOWN OF CURRENT CHARGES

Rate: GSA2-50-General Service - 50-1000 kW
Description: BLOWER BLDG
Meter Number: 999065
MR. Type: Usage
Prior Reading: 134 **Present Reading:** 160
KwH Usage: 26 -Actual; **Last Year** 191900; **Last Month** 163524

Description: BLOWER BLDG
Meter Number: 226134
MR. Type: Usage
Prior Reading: 1123 **Present Reading:** 1308 **Multiplier** 200
KwH Usage: 37000 -Actual; **Last Year** 191900; **Last Month** 163524

Description: BLOWER BLDG
Meter Number: 226134
MR. Type: Usage
Prior Reading: 0 **Present Reading:** 0 **Multiplier** 200
KwH Usage: 0 -Actual; **Last Year** 191900; **Last Month** 163524
KW Usage 62.800

Description: BLOWER BLDG
Meter Number: 226134
MR. Type: Usage
Prior Reading: 0 **Present Reading:** 0 **Multiplier** 200
KwH Usage: 0 -Actual; **Last Year** 191900; **Last Month** 163524
KVA Usage 67.000

Description: BLOWER BLDG
Meter Number: 999065
MR. Type: Solar Generation
Prior Reading: 91846 **Present Reading:** 4175
KwH Generation: 12329 -Actual; **Last Year** 191900; **Last Month** 163524

Customer Charge	$45.33
Energy Charge under 15000 KWH	$1464.90
Energy Charge over 15000 KWH	$1241.61
TVA Fuel Cost Adjustment under	$95.70
TVA Fuel Cost Adjustment over	$139.20
Demand Charge over 50 KW	$149.76
Generation Credit	$-2716.94

50
3150.
X80 % =
$2173.55

Rate: GSA2-50-General Service - 50-1000 kW
Description: SLUDGE BLDG
Meter Number: 134359
MR. Type: Usage
Prior Reading: 2525 **Present Reading:** 2961 **Multiplier** 300
KwH Usage: 130800 -Actual; **Last Year** 191900; **Last Month** 163524

Description: SLUDGE BLDG
Meter Number: 134359
MR. Type: Usage

700000135188

DETACH AND RETURN WITH YOUR CHECK PAYABLE TO "MIDDLE TENNESSEE ELECTRIC MEMBERSHIP CORPORATION" 700000135188

MEMBERSHIP NUMBER 1000 0684 82	ACCOUNT NUMBER 2000 2288 7523

DUE DATE:	02/19/13	TOTAL DUE:	$14,735.99

Features:

- Usage in kWh
- Metered Demand vs. Billed Demand
- # of Days Billed
- Tiered rate structure
- Generation credit
- Rate Strucure

R4 EAT – Things to Remember

1. Month of implementation:
   - Defines the break between benchmark period and tracking period.
   - Need at least 24 months of electrical data prior to this date

R4 EAT – Things to Remember

2. Electrical billing periods:
   - Often, these don't match with the calendar month (e.g., Aug 4 – Sept 6)
   - Match electric data to a DMR flow month that makes sense (e.g., Aug). Be consistent going forward.

R4 EAT – Things to Remember

3. Call us if you have questions
   - No, really!

Contact Information

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